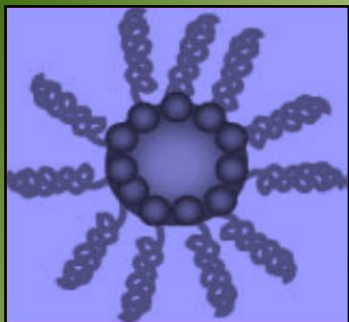




Festival of innovations – 2016



Micellar nanocontainers for the delivery of poorly soluble vitamins in Biomedicine

Industry: nanobiotechnology and nanomedicine



Project description:

New biocompatible and biodegradable micellar carriers for the delivery of fat-soluble vitamins (A, E, D) in living organisms are proposed , as well as the technology of obtaining and use of such micellar systems as an efficient dietary supplements in animal husbandry, fisheries and medicine.

The actual task of Biomedicine: creating of the efficient carriers for poorly soluble and/or toxic drug substances and biopolymers in living organisms

Polymeric micelles (micellar nanocontainers) are the ones of the most promising nanocarriers; they allow to:

- create water soluble forms of poorly soluble drugs;
- ensure long circulation of drugs in the circulatory system;
- prevent rapid degradation of the drug in the enzymatic and metabolic processes;
- significantly reduce therapeutic dose of the drugs;
- protect healthy organs and tissues of a living organism from the destructive action of toxic drugs, especially in chemotherapy;
- get rid of unwanted response from the immune system of the organism to the introduction of foreign proteins and nucleic acids.

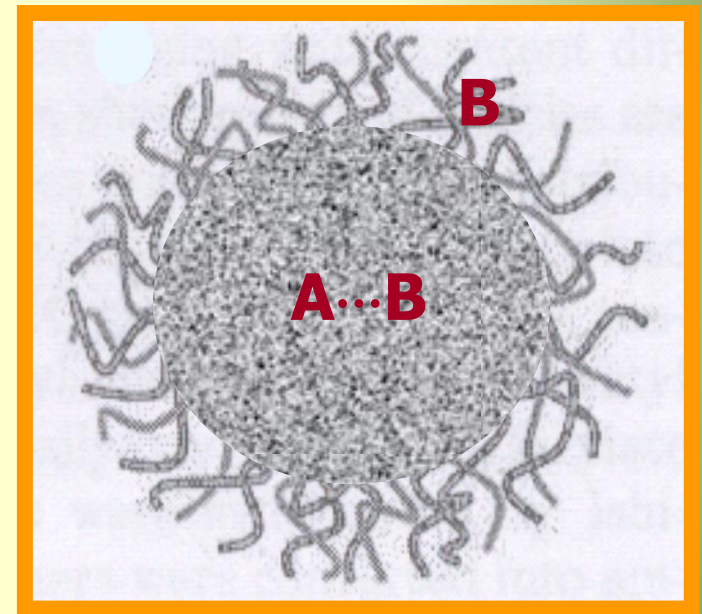
Type of traditional micellar nanocarriers is “**hydrophobic core**” – “**hydrophilic corona**” based on amphiphilic block copolymers, which self-assemble in water media

Project idea : use the new micellar nanocarriers on the basis of the asymmetric block copolymers with interactive hydrophilic blocks for drug delivery



IntraPC

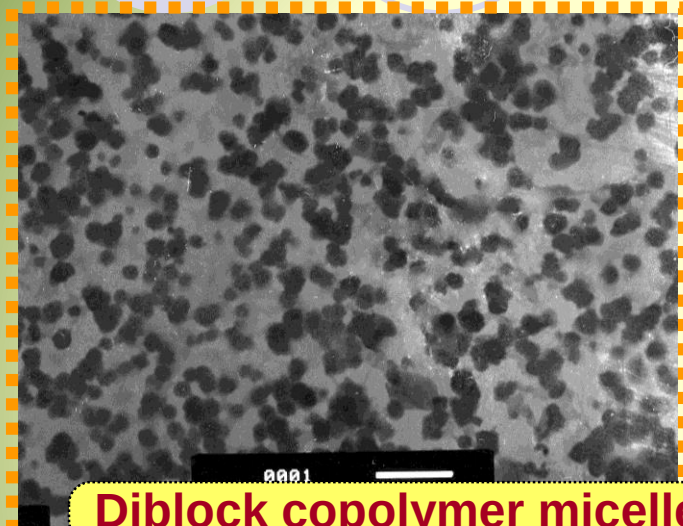
Self-assembly
Intra PC



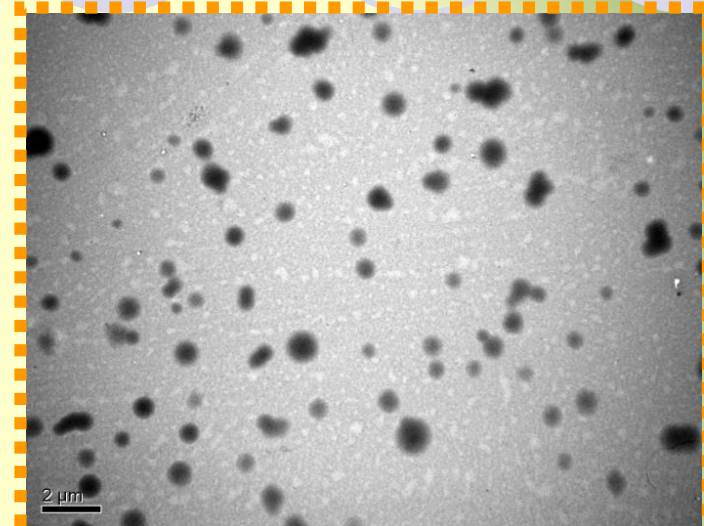
Advantages:

- the simpler of the micellar carrier structure;
- the increased binding capacity of complex “core” to drugs of different nature;
- the impossibility of the micelles destruction on the individual components under the influence of competitive interactions in a living organism.

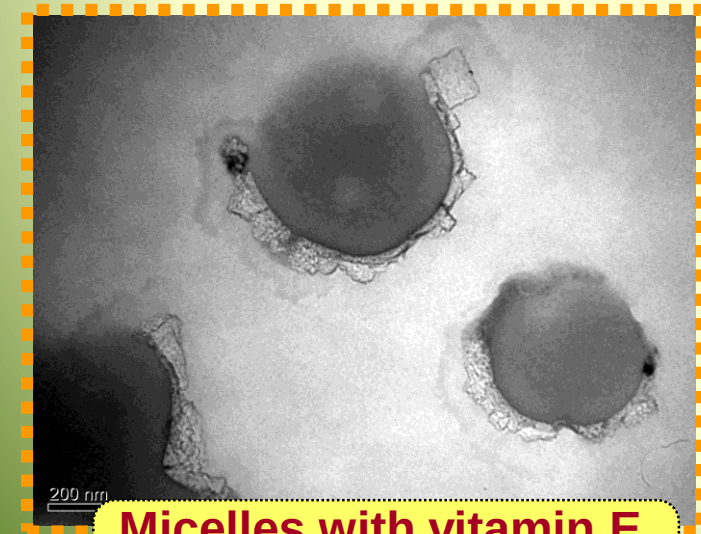
Some examples of the developed micelles and micellar systems with vitamin E: Transmission electron microscopy



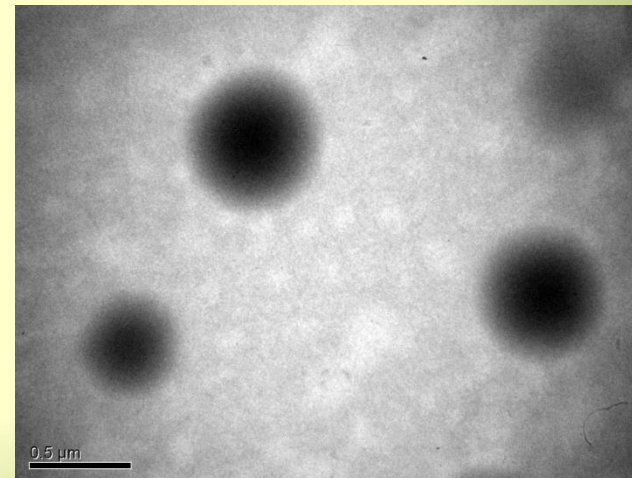
Diblock copolymer micelles



Triblock copolymer micelles



Micelles with vitamin E



Micellar systems testing:



Micellar carriers with Vitamin E

- 1 Biological effect on the metabolism of white mice
- 2 Biological effect on the metabolism of the rabbits and the quality of the obtained meat
- 3 Biological effect on the productivity of sows and piglets

- The possibility of reducing the dose up to 25 times,
- The improving the quality of rabbit meat and fur,
- The increase in multiple pregnancy of sows and the survival of piglets

World market of drug carriers

**Companies working in the field of nanomedicine –
– 276 companies from 23 countries:**



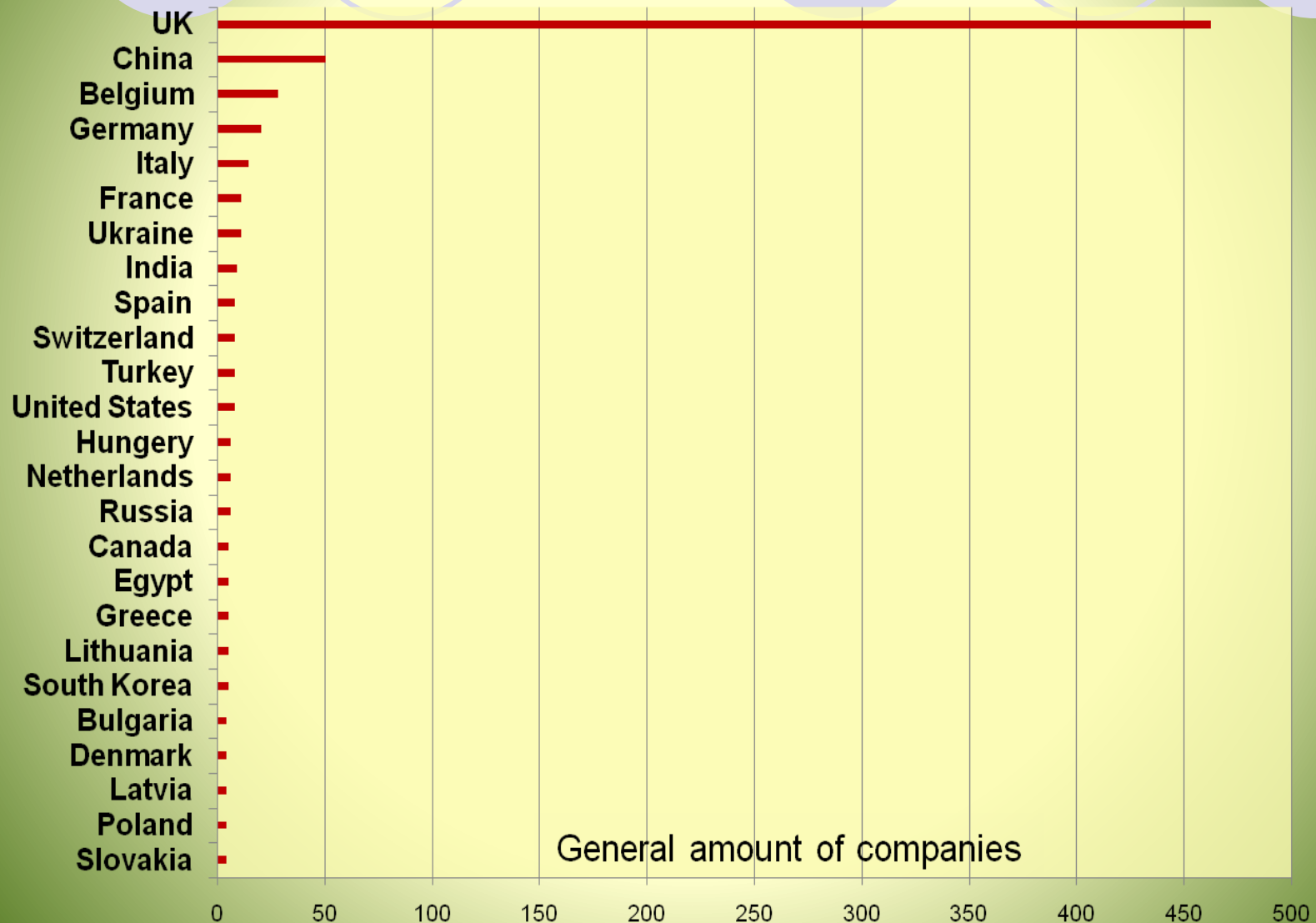
World market of drug carriers

Companies working in the field of drug delivery –
– 58 companies from 16 countries:



World market for vitamins production

Leading companies in manufacturing of vitamins – 747 companies from 45 countries

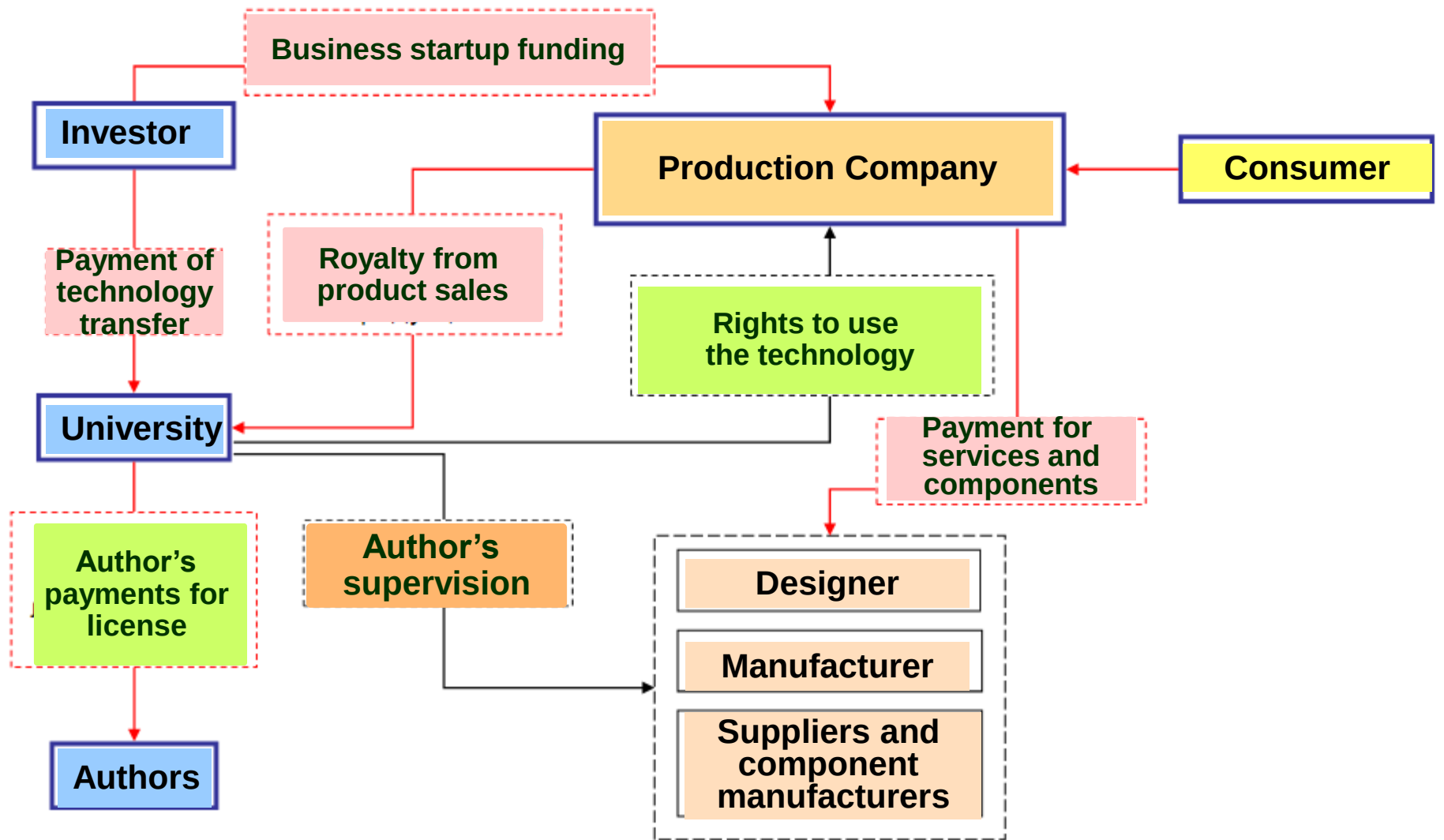


Competitive environment

Companies manufacturing of coated vitamins:

Vitamins	Status	Company	Country
B1, B6, B12	on the market	Microbelcaps	Belgium
C	on the market	Hebei Tianyin Biotech CO.,LTD	China
C	on the market	Gemini Health Productions	China
E+Se	on the market	Lohmann Animal Health GMBH	Germany
B1, B6, B12	on the market	La Fame Cosmetics	Germany
A, E	on the market	Hansa Vital GMBH	Germany
A, E	on the market	Phytopharma LTD	Bulgaria
E+Se	on the market	Biofactor Sp. z.o.o.	Poland

BUSINESS-MODEL FOR TECHNOLOGY TRANSFER - LICENSING



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Transfer of the technology for reception of micellar carriers
for the delivery of fat-soluble vitamins

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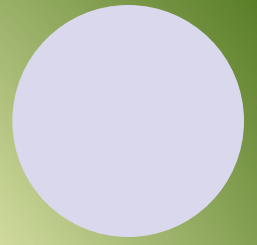
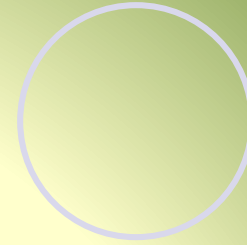
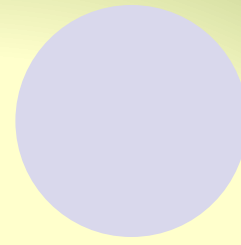
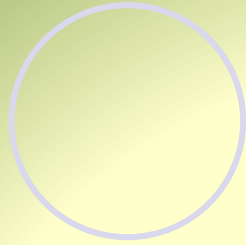
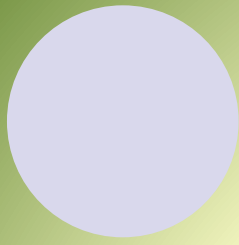


M. Ignatovska

Testing of biological effects of the micellar systems with vitamins

Main stages and budget of the project:

The stages and their contents		Execution time, months	Expenditures, mln UAH
1	Formalization of the technology in the form of the technical task; identification of the restrictions and risks	5	0,4
2	Release and characterization of the pilot series of two micellar systems with vitamin E	6	1,2 (without vitamin)
3	Release and characterization of the pilot series of two micellar systems with vitamin A and D	6	1,2 (without vitamin)
4	Clinical researches of the biological effect of four micellar systems <i>in vivo</i> on white mice and rabbits	16	1,9
5	Correction of the technical task; the transfer of rights to use of the technology of the production of vitamins in micellar carriers	3	0,3
All:		36	5,0



Thank you for your attention!